Fiscal Activism and the Cost of Debt Financing*

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Abstract

In this paper, we estimate the impact of changes in fiscal policy regime on the yield curve. In particular, we differentiate between yield curve responses under *active* and *passive* fiscal policy regimes (according to the terminology of Leeper 1991). Analyzing US data in the period 1965-2010, we find a statistically significant impact of fiscal policy only for the active policy regime. A one-percentage-point shock in the primary deficit leads typically to a contemporaneous increase in long-term yields of about 10 basis points, and even stronger cumulative effects. No significant impact of deficits on yields is found in the passive fiscal policy regime.

JEL classifications: G12, E62

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1 Introduction

As part of the policy response to the ongoing financial crisis (2008-2010), fiscal policy turned active again in a large number of developed countries. By turning active, fiscal policy was re-directed towards economic stabilization, instead of debt stabilization, thereby supporting and reinforcing the expansionary stance of monetary policy. While the expansionary impact of monetary policy is generally accepted, there is less consensus concerning the impact of fiscal policy. Much of the debate centers around the potential interest rate impact of fiscal expansions. According to standard IS-LM reasoning, fiscal stimuli lead to significant increase in aggregate demand which, if not met with appropriate monetary expansions, leads to increases in long-term rates and some degree of crowding out of private investment. However, this view has been challenged both on theoretical and empirical grounds. First, various theoretical models based on Ricardian equivalence predict insignificant or quantitatively negligible effects on aggregate demand (increased deficits induce higher private savings, limiting the impact on interest rates). Second, the empirical studies on crowding out have been in general inconclusive, with findings often sensitive to the specific type of statistical methods. In particular, studies employing standard time series methods have not been able to identify statistically significant effects (e.g. Evans (1985), Evans (1987), Mountford and Uhlig (2009) or Perotti (2005)), while some supportive evidence has been found by either focussing on announcement effects (e.g. Wachtel and Young (1987), Kitchen (1996) or Elmendorf (1993)) or on larger fiscal expansions and contractions (e.g. Ardagna (2009)).

The main goal of this paper is to assess empirically the impact of fiscal policy on the yield curve, conditioning on the fiscal policy regime. Specifically, we distinguish between *active* and *passive* policy regimes (see Leeper (1991)). The passive fiscal policy regime is identified by fiscal policy consistent with a non-accelerating, stabilizing debt-to-gdp dynamics, while in the active policy regime, fiscal policy is set in function of generating certain macroeconomic effects, independently of the debt-to-GDP ratio. Conditioning on the fiscal policy regime is important and may facilitate the statistical identification of potential crowding out effects for three reasons. First, fiscal policy regimes have been empirically identified for the US economy: Favero and Monacelli (2005), using a Markov switching framework, find evidence of significant regime switches in US fiscal policy over the period 1960-2002. Second, by differentiating between active and passive policy regimes, we may better identify shocks to expected future deficits. As discussed by Gale and Orszag (2002), anticipated (next to current) deficits play a crucial role in the occurrence of crowding out effects. This argumentation follows Feldstein (1986) in concluding that anticipated and persistent increases in deficits are likely to have more significant impact on long-term rates through larger expectations and risk premium effects. By differentiating between active and passive policy, we explicitly separate regimes with substantial differences in anticipated future deficits. In particular, deficits are expected to increase much more during the active than during the passive fiscal policy regime. Finally, it has been shown that significant impact of the fiscal deficits on yields is found for large structural changes in fiscal policy. Large expansions or contractions in deficits are typically found to generate significant effects on long-term yields. For instance, Ardagna (2009) or Kiani (2009), focussing on larger fiscal expansions and contractions across a set of OECD countries, observe strong and significant yield curve effects. Switches between policy regimes are likely to generate such structural changes in the (anticipated) fiscal policy stance.

The above arguments suggest substantial differences in the impact of deficits across policy regimes. In this paper, we assess the regime-dependent impact of deficits on yields for the US. We proceed in two steps. First, following Favero and Monacelli (2005), we use a standard Markov switching framework to identify active and passive policy regimes. Fiscal policy regimes are identified through the fiscal policy rules, where the policy rule of the passive regime is consistent with debt stabilization. The empirical results from our sample corroborate the findings of Favero and Monacelli (2005): we identify an active and a passive regime with clear and relatively frequent shifts between active and passive policies. Second, conditional on the policy regime, we assess the impact of fiscal policy on interest rates by estimating the yield curve responses to fiscal deficit changes. By estimating the price impact across maturities, we are able to differentiate between the impact on short-term and long-term interest rates in each of the policy regimes. The empirical analysis leads to the following conclusions. First, we find statistically significant effects in the active policy regime (even after controlling for other yield curve determinants) with contemporaneous increases of about ten basis points per percentage point increase in the primary deficit and much larger cumulative dynamic effects. Second, no significant impact is found under the passive fiscal policy regime. Third, in the active regime, we observe cross-sectional differences in the impact of deficits on yields. In particular, larger price impacts are found at the longer end of the maturity spectrum while for shorter maturities we do not find strong price effects.

The remainder of the paper is structured as follows. In Section 2, we define the active and the passive fiscal policy regime, set out the Markov-switching model used to identify the regimes and discuss the occurrence of active and passive regimes. Subsequently, in Section 3, we estimate the price impact of primary deficit shocks on the yield curve. Both unconditional and conditional (on the policy regime) results are presented. Finally, Section 4 concludes by summarizing the main findings.

2 Policy Regimes

2.1 Active and passive fiscal policy rules

We follow the literature on fiscal policy feedback rules in describing fiscal policy. The policy feedback rule decomposes fiscal policy decisions, represented by the primary deficit (relative to gdp), d_t, into three components: the previous deficit (modeling inertia of fiscal policy), d_{t-1}, the target deficit, $\bar{d}_t$, and an idiosyncratic fiscal policy shock, ε_t. Formally, the fiscal policy rule is presented as follows:

$$\begin{aligned} d_t &= \rho(s_t)d_{t-1} + (1-\rho(s_t))\bar{d}_t + \varepsilon_t(s_t), \\ \bar{d}_t &= c(s_t) + \gamma(s_t)y_t + \delta(s_t)d_t^S, \end{aligned} \tag{1}$$

where the target deficit consists of a cyclically adjusted target deficit, d_t^S, and a term allowing for the counter-cyclical component of fiscal policy, $\gamma(s_t)y_t$, assumed proportional to the output gap. Importantly, we allow for regime dependence in the policy rule. The regime dependence follows from the dependence of the parameters in the policy rule on the regime variable $s_t = \{1, 2\}$. The regime variable s_t is assumed to follow the first-order Markov process with transition matrix P, whose element is $p_{ij} = Pr\left[s_t = i, s_{t-1} = j\right]$:

$$P = \begin{bmatrix} p & 1-q \\ 1-p & q \end{bmatrix}. \tag{2}$$

We follow Favero and Monacelli (2005) in identifying passive fiscal policy through the implications for the debt dynamics, as described by the policy rule. Specifically, the passive fiscal policy regime is identified through a feedback rule consistent with the implicit debt-stabilization motive. As is well known, the implied (cyclically adjusted) deficit consistent with debt stabilization can be derived from the debt accumulation equation:

$$b_t = \frac{(1+i_t^d)}{(1+g_t)}b_{t-1} + d_t, \tag{3}$$

where b_t denotes the debt-to-gdp ratio, i_t^d the interest rate paid on government debt and g_t the growth rate of nominal gdp. Stabilizing the debt ratio ($b_t = b_{t-1}$), then, implies the following target primary deficit:

$$d_t^S = \frac{g_t - i_t^d}{(1+g_t)} b_{t-1}. \tag{4}$$

Stabilization of the debt-to-gdp ratio, thus, requires primary surpluses (in the case where the implied interest rate exceeds the nominal growth rate, i.e. $i^d > g$) or restricted deficits (in the case where the nominal growth rate of gdp exceeds the implied interest rate, i.e. $i^d < g$). We define the fiscal policy as passive if it is consistent with debt stabilization, i.e. if the feedback rule in equation (1) is in the long run consistent with the target primary deficit, d_t^S :

$$|\rho(s_t)| < 1, \; c(s_t) = 0, \; \delta(s_t) = 1. \tag{5}$$

2.2 Estimating policy rules

We assess the occurrence of active and passive policy in the US by estimating the Markov switching model discussed in the previous section. First, we discuss data issues and, subsequently, we present the estimation results.

2.2.1 Data

The data set consists of US data spanning the period 1965Q2 till 2009Q4. The NIPA tables (i.e. NIPA table 3.2) were used to collect information on primary deficits (obtained as government expenditures net of interest rate payments minus government revenues). As a result, we obtain a primary fiscal deficit series with positive (negative) values referring to deficits (surpluses). Total debt is obtained from the FRED data set. We also collect data on debt held privately (i.e. series FDHBPIN).[1] Finally, we use the gdp deflator as base series to form inflation, take seasonally adjusted gdp and CBO-based estimates of the output gap to compute, respectively, growth rates and output gaps. We compute the stabilizing primary deficit in two steps by using an HP smoothed version of the deficit implied by equation (4).[2]

Insert Figure 1

Figure 1 Panel (a) presents the actual and the target (stabilizing) primary deficit. As can be observed, the actual deficit displays substantial time variation, mostly centered around the stabilizing primary deficit. The stabilizing primary deficit is in line with the estimates

[1] Note that we also estimated models where total debt was used. The main findings of the paper are robust to the choice of type of debt.

[2] We use a relatively high value for $\lambda = 1600$ in the HP filter so as to generate a relatively smooth trend part for the target deficit.

provided by Favero and Monacelli (2005). It is most often negative implying that, in general, primary surpluses are required to stabilize the debt-to-gdp ratio. The latter conclusion derives from the fact that the average interest paid on government debt exceeds the growth rate of nominal gdp (see equation (4)). However, note that before 1980 (i.e. 1965-1979), the stabilizing primary deficit is positive, indicating that the growth rate of nominal gdp exceeded the average interest rate on government debt. Panel (b) displays the scatter plot of the actual and stabilizing primary deficit and illustrates their substantial differences. Absence of a strong link between the two suggests that, besides debt stabilization, other factors drive actual fiscal policy. Panels (c) and (d) display the (privately held) debt-to-gdp dynamics and the relation between actual primary deficit and debt-to-gdp ratio, respectively. In particular, Panel (d) illustrates the link between primary deficit and debt-to-gdp level. Overall, and in line with Bohn (1998), we observe a dominating negative relation between primary deficits and debt levels. This negative correlation is suggesting that US fiscal policy has been overall passive. Smaller primary deficits (and often higher primary surpluses) are observed on average for higher debt-to-gdp ratios. Note, however, that also a substantial amount of outliers (high primary deficits) are observed, suggesting the appearance of active fiscal policy over specific and brief periods.

2.2.2 Results

Table 1 contains the estimation results for alternative specifications of the fiscal policy rule. Two sets of models were estimated. First, Panel A presents regression results deriving from the assumption of a regime-independent (linear) policy rule. Panel B contains the estimation results obtained from an unrestricted, two regime, Markov-switching model. Finally, Panels C and D impose the identification restrictions for a passive policy regime (on regime $s_t = 1$), i.e. imposes the restrictions $|\rho(s_t = 1)| < 1$, $c(s_t = 1) = 0$, $\delta(s_t = 1) = 1$. The results in Table 1 highlight several conclusions.

Insert Table 1 and Figure 2

First, overall, US fiscal policy can be modeled in terms of simple policy rules. Specifically, all models in Table 1 explaining the primary deficit by means of three variables (lagged deficit, output gap and stabilizing primary deficit) perform reasonably well in replicating observed primary deficits. Typically, the rules explain about 90 percent of the variation in the actual observed primary deficits and the estimated signs are generally in line with theory.

Second, there is clear evidence that fiscal policy (i.e. primary deficits) are regime-dependent: all three versions of the Markov switching representation outperform the linear specification of the fiscal policy rule in terms of R-square, log-likelihood and BIC. The univocal preference across model specification tests in favor of the Markov switching representation can be seen as strong statistical support for the presence of fiscal policy regime shifts.

Third, analysis of the Markov switching representation clearly identifies a passive and an active fiscal policy regime, respectively regime $s_t = 1$ and $s_t = 2$. Active fiscal policy is identified as a policy regime characterized by (i) relatively low policy inertia $\rho(s_t = 2) = 0.54$, (ii) an explosive primary deficit dynamics, inconsistent with a debt-stabilization goal (the parameter on the stabilizing primary deficit is negative $(1 - \rho(s_t = 2))\delta(s_t = 2) = -0.41$) and (iii) substantial fiscal policy shocks, $\sigma^2(s_t = 2) = 0.0094$. The passive policy rule, on the contrary, is characterized by (i) substantial inertia, $\rho(s_t = 1) = 0.82$, (ii) a primary deficit consistent with debt stabilization, $(1 - \rho(s_t = 1))\delta(s_t = 1) = 0.11$) and (iii) relatively small policy shocks, $\sigma^2(s_t = 1) = 0.000014$. To formally test for the passivity of Regime 1, we estimated two additional versions of the Markov switching model: one imposing the one-to-one (long-run) relation between the actual and the debt stabilizing deficit ($\delta(s_t = 1) = 1$) and one imposing all identification restrictions for passivity: $\delta(s_t = 1) = 1$ and $c(s_t = 1) = 0$. Both types of restrictions are not statistically rejected as indicated by the respective loglikelihood ratio tests, i.e. 1.66 (p-value 0.8) and 3.66 (p-value 0.84). Additional supportive evidence is provided by the BIC criterion, clearly identifying the model imposing the passive policy restrictions as the statistically superior representation.

Finally, Figure 2 depicts the regime probabilities and identifies the active and passive fiscal policy periods. As can be observed and in line with previous studies, we find that fiscal policy has been predominantly passive. Nevertheless, we observe recurrent periods characterized by active fiscal policy. The estimated probabilities suggest expected duration of the passive and active fiscal policy regime of, respectively, about 28 and 6 quarters. The identified periods of active fiscal policy are in line with other studies. In particular, we obtain similar periods of active policy as Favero and Monacelli (2005), using a sample up to 2002, and additionally identify the current financial crisis as a new episode of fiscal activism. These identified active regimes have clear connections to specific periods in US politics characterized by activism. The short-lived '74-'75 activist period can be linked to the fiscal policy program of the Carter administration, while the Bush administration (allowing for three successive tax cuts in 2001, 2002 and 2003) is identified as an active period by the Markov switching model (2001-2005). Finally, the Markov switching model dates the beginning of the current active period around mid 2008, concurring with the beginning of the crisis (with the bankruptcy of Lehman Brothers).

3 Fiscal activism and the cost of debt financing

Statistical analysis of the impact of fiscal policy on interest rates has been inconclusive so far. In particular, reported estimates of the interest rate sensitivity to primary deficits (i.e. crowding out effects) differ significantly across studies, ranging from significantly positive to insignificant or even negative values. The lack of conformity in empirical findings can be partially explained by alternative econometric methods. As discussed in e.g. Favero and Giglio (2006), issues related to identification, regime-dependence and debt maturity can explain the wide range of often contradictory findings. Analysis based on standard linear regression techniques, projecting interest rates of various maturities on fiscal deficit, yields small and often insignificant effects. This could be interpreted as evidence against a strong pattern in the bivariate correlation of interest rates and deficits.[3] Alternatively, the failure to find significant effects could be explained by the lack of identification arising from the difficulty to isolate the fiscal policy effect on yields. In particular, business cycle developments may hamper the identification of the fiscal policy effect: fiscal deficits typically move countercyclically while interest rates move procyclically. To overcome these identification issues, alternative identification techniques have been proposed. Studies analyzing the price impact of announcements of changes in fiscal policy (e.g. Wachtel and Young (1987), Kitchen (1996), Calomiris *et al.* (2003) or Laubach (2009)) or focussing on the price impact of large changes in deficits (changes in regimes), e.g. Ardagna (2009) or Kiani (2009), have typically reported significant price (interest) impact of fiscal deficits.

In this paper, we use an alternative approach to identifying price impact by focussing on periods of active fiscal policy. Periods of fiscal activism are arguably well-suited to identify the price impact of fiscal deficits because of the implied expectations and risk premium effects. Following Feldstein (1986), it can be argued that expected future deficits have stronger price impact than current deficits (due to the expectations and the risk premium effects). By focussing on periods of fiscal activism, we reinforce expectations and risk premium effects and hence facilitate the identification of the price impact of fiscal policy.[4]

The impact of fiscal deficits (and the differentiation between active and passive price effects) is measured across the maturity spectrum of the yield curve. To this end, we use a

[3] Examples of empirical studies failing to detect strong/significant impact of fiscal deficit (shocks) on yields include Evans and Marshall (2002) and Miller and Russek (1996).

[4] Active fiscal policy is often associated with persistently increasing debt-to-gdp ratios.

standard regression model for the (zero-coupon) yield on US government debt instruments with maturity m, $i_t(m)$:

$$i_t(m) = c + \rho_i i_{t-1}(m) + (\delta + \delta^A I(s_t))d_t + \gamma_y y_t + \gamma_\pi \pi_t. \tag{6}$$

The regression model includes the standard macroeconomic determinants of the yield curve: i.e. lagged yields $i_{t-1}(m)$, inflation π_t, the output gap, y_t, and additionally allows for an impact of the primary deficit d_t. Moreover, we differentiate between the price impact of deficits in active and passive policy regimes by introducing an additional variable in the active policy regime, $I(s_t)d_t$. The indicator function $I(s_t)$ takes on a value of 1 during periods of fiscal activism ($s_t = 2$) and zero in the passive regime ($s_t = 1$). The estimated price impact of passive fiscal policy is therefore given by δ while under active fiscal policy the total effect of deficits is given by $\delta + \delta^A$.

Insert Table 2

Table 2 presents the OLS estimates for equation (6) for yields (on zero coupon bonds) with maturities 1, 3, 5 and 10 years. In line with the literature, we find (i) strong inertia in yield dynamics (ρ ranges from 0.94 to 0.97), (ii) significant and positive impact of inflation on yields, and, (iii) the procyclicality of yields measured by the positive impact of the output gap. Importantly, note that we do not find significant price impact of deficits during the passive policy regime. In general, we observe a statistically insignificant negative price impact in the passive regime. Consequently and against the background that the passive fiscal policy regime is the most frequent policy regime, our findings concur with the view that fiscal policy does not significantly impact on the yield curve. Note that this finding holds across the maturity spectrum. However, we do find statistically significant crowding out effects for the active policy regime. While for short maturities we obtain insignificant parameters, δ^A, we observe significant price impact on the longer end of the yield curve (i.e. the five and ten year maturities). In particular, the impact parameter for the 10 year maturity is estimated around 0.10, which identifies the (instantaneous) long-term yield impact of a switch from passive to active fiscal policy at 10 basis points per percentage point increase in the primary deficit.

Insert Figure 3

To assess the economic significance of the estimation, we analyze the impact on the yield curve of a switch from passive to active fiscal policy. To this end, we use the Markov switching model to estimate the yield curve impact of a switch from passive to active policy for different horizons.[5] Keeping in mind that the average duration of the active regime (implied by the Markov switching model) is estimated around six quarters, we simulate the impact on the yield curve over six quarters. Figure 3 illustrates the price impact of the switch from passive to active policy for different horizons by tracking the difference between yields under the active and the passive regime. We observe initially a small effect of about 10 basis points, with the initial impact increasing in maturity, indicating that with the switch from passive to active policy, yields only increase marginally (about 10 basis points for the 10 year yield). Over time, however, the initial impact is amplified, growing steadily to an overall effect of about 50 basis points after 6 quarters.[6] Clearly, these dynamic effects establish the economic significance of fiscal deficits under fiscal activism.

4 Conclusion

In this paper, we analyze empirically the impact of fiscal policy on the yield curve. Unlike standard statistical procedures used in the literature, we allow for regime switches in the fiscal policy stance (as documented by Favero and Monacelli (2005)). Subsequently, we differentiate between the impact on yields of fiscal policy in the active and passive policy modes. In particular, we use the active policy regime to identify crowding out effects.

The findings can be summarized as follows. First, using a standard two-state Markov switching model, we find strong evidence of regime switches in the fiscal policy stance in the US. Statistical testing, moreover, does not reject the interpretation of policy regimes as active and passive. While the passive regime dominates over the 1965-2010 period, there are clear indications of switches towards more active fiscal policies. Second, we find evidence of a price impact of fiscal policy, as measured by primary deficits, in the active policy regime. The price impact is especially pronounced at the longer end of the maturity spectrum. More specifically, a switch from a passive to an active policy regime generates an instantaneous increase of ten basis points per percentage point deficit, increasing with the duration of the active fiscal policy stance. Finally, no significant price effects of fiscal policy are observed in the passive policy regime. The latter two points corroborate the Feldstein (1986) thesis stating that expectations of future expected deficits, and not so much current deficits, drive

[5] We start the simulation from steady state. The steady state is measured by the yield implied by the empirical average of the determinants π, y while assuming a primary deficit of 1 percentage point.

[6] This impact would increase as long as the active fiscal policy regime would remain in place (with a limit of about 2.5 percent). However, the probability of fiscal policy remaining active over protracted periods of time is negligibly small in this Markov setting.

the impact of fiscal policy on the yield curve.

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Figure 1: Pirmary deficits and debt-to-gdp ratio for the US: 1965-2010

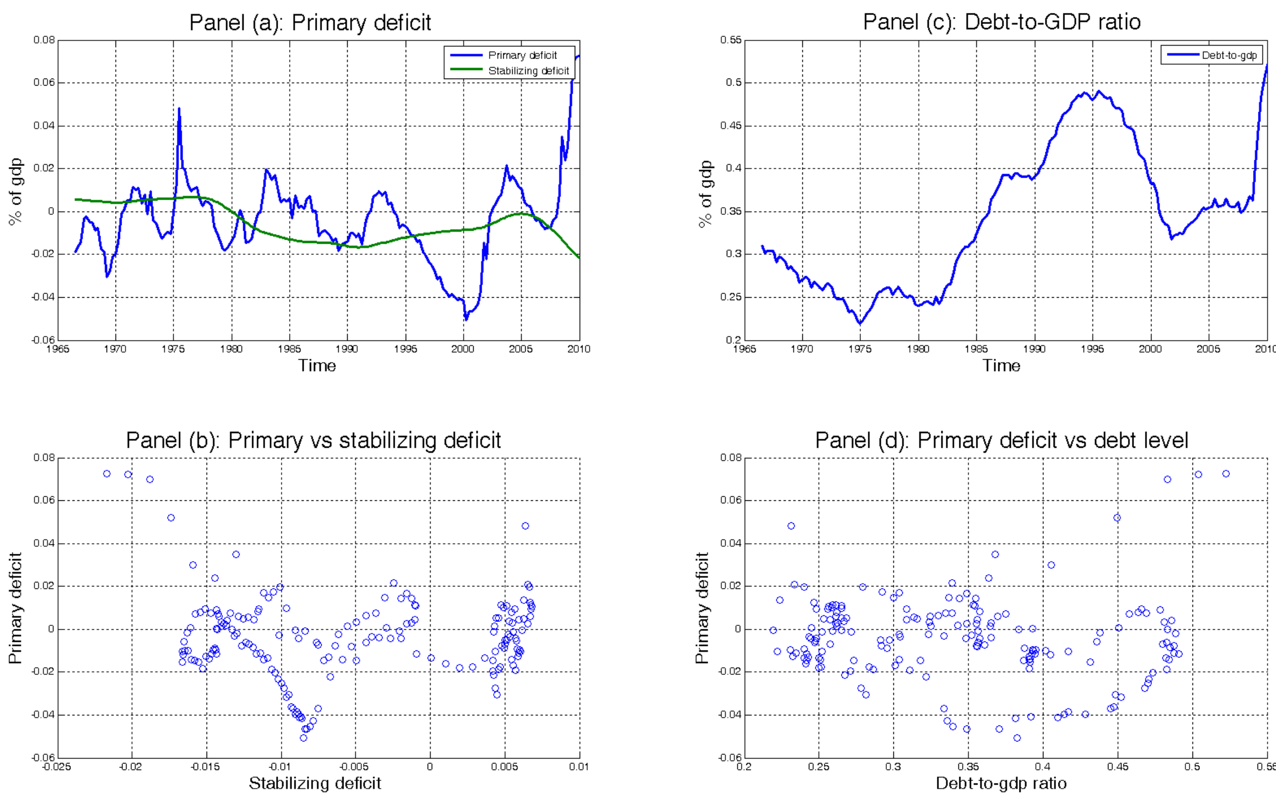

Figure 2: Markov switching representation of the US primary deficit: 1965-2010

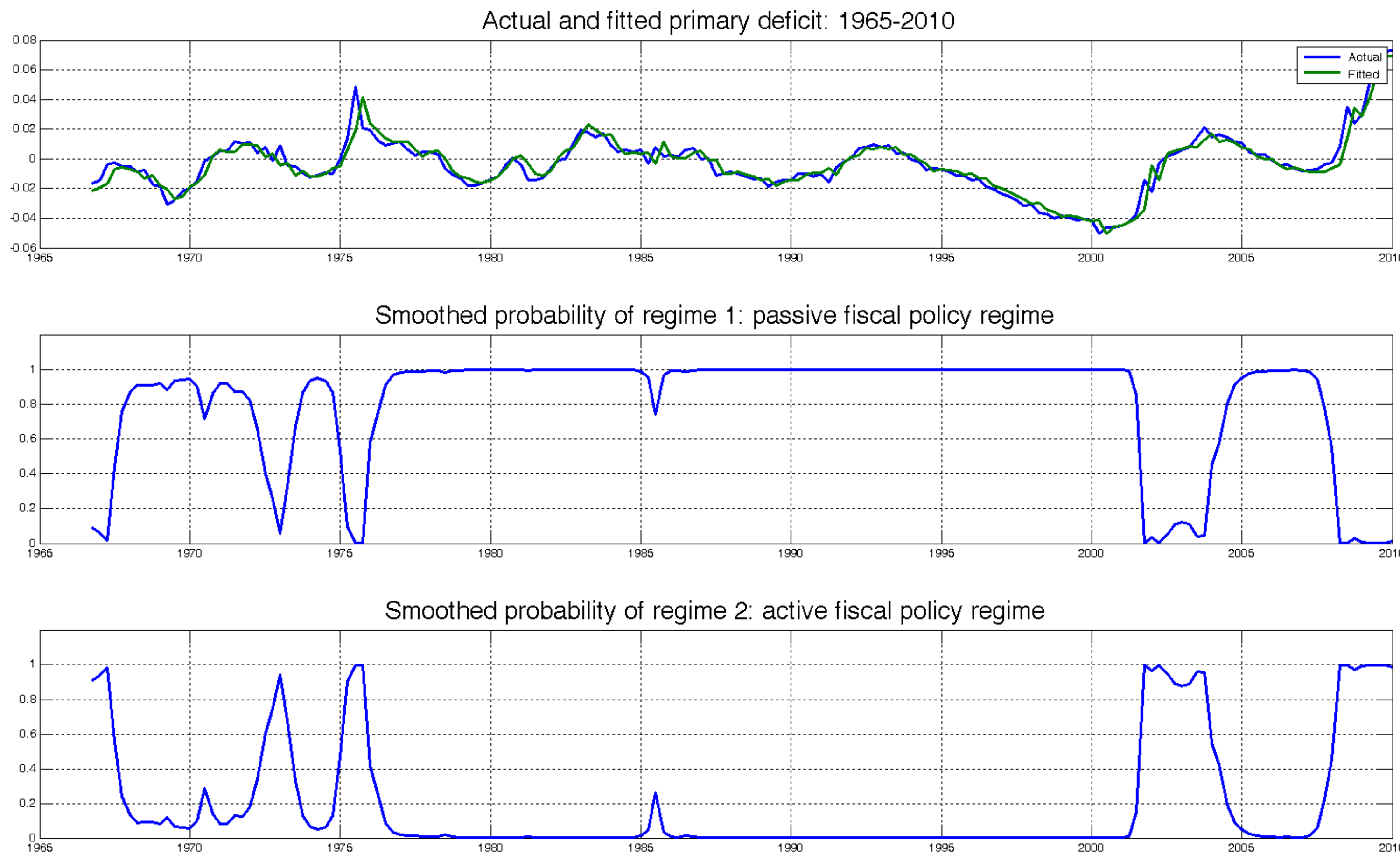

Figure 3: Estimated impact of switch from passive to active policy on the yield curve

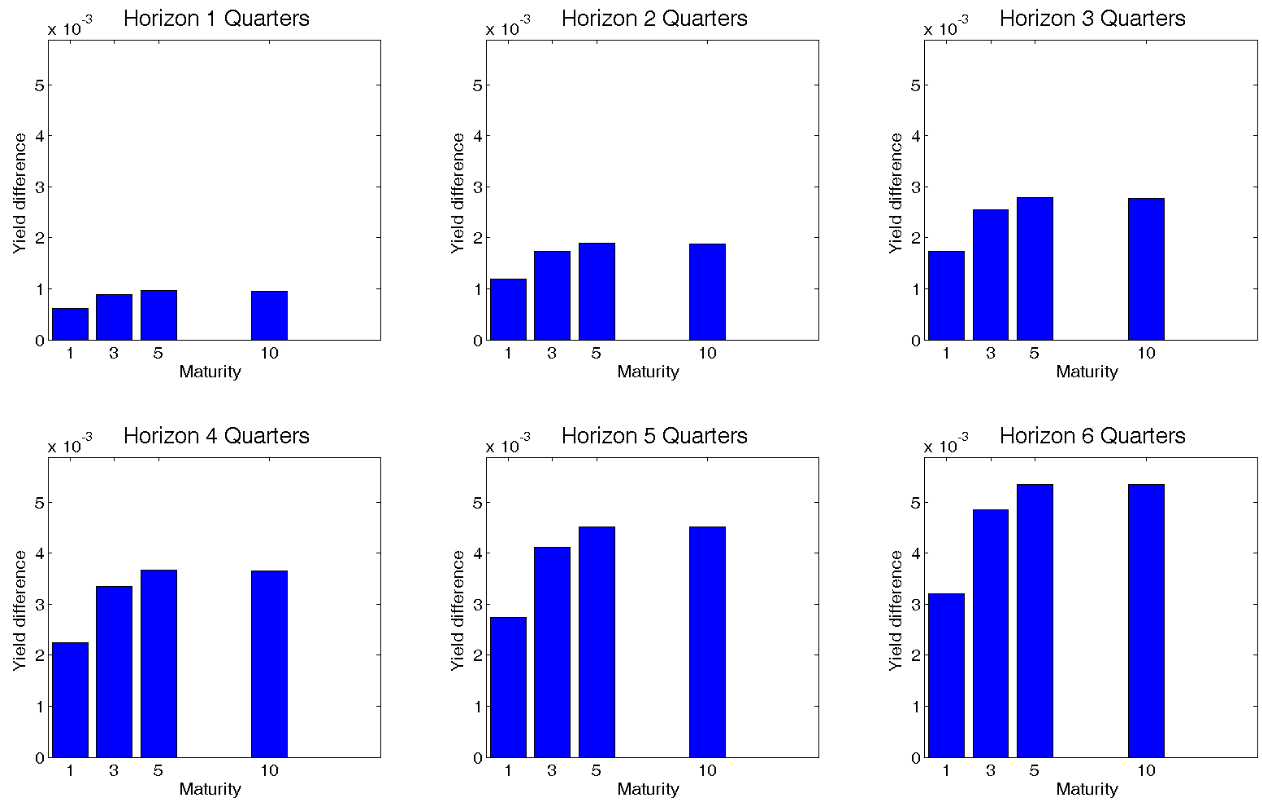

Table 1: FISCAL POLICY RULES: LINEAR AND MARKOV SWITCHING MODELS

	Estimated parameters in fiscal policy rule									
	c$(1-\rho)$	ρ	$\delta(1-\rho)$	$\gamma(1-\rho)$	$\sigma_\varepsilon(\times 10^2)$	p	q	R^2	$Logl$	BIC
	Fiscal policy rule: linear model									
Model. statistics								0.89	628.48	-1236.3
Lin. state	0.0007	0.8646	0.0654	-0.1240	0.0043					
	(0.0006)	(0.0364)	(0.0667)	(0.0271)	(0.0001)					
	Fiscal policy rule: Markov switching model									
Model. statistics								0.91	671.84	-1271.5
Regime 1	-0.0007	0.8234	0.1147	-0.1237	0.0014	0.9639				
	(0.0004)	(0.0300)	(0.0466)	(0.0175)	(0.0002)	(0.0839)				
Regime 2	0.0076	0.5400	-0.4099	-0.2899	0.9424		0.8438			
	(0.0035)	(0.2063)	(0.2262)	(0.1347)	(0.0032)		(0.1725)			
	Fiscal policy rule: Restricted Markov switching model ($\delta(1) = 1$)									
Model. statistics								0.91	671.01	-1276.6
Regime 1	-0.0002	0.8352	0.1648	-0.1230	0.0015	0.9646				
Regime 2	0.0075	0.5314	0.0524	-0.2970	0.9615		0.8378			
	Fiscal policy rule: Restricted Markov switching model ($\delta(1) = 1$, $c(1) = 0$)									
Model. statistics								0.91	670.03	-1281.8
Regime 1	0.0000	0.8444	0.1556	-0.1105	0.0018	0.9768				
Regime 2	0.0028	0.2863	-0.3375	-0.5902	0.9329		0.8500			

Notes:

Table 2: Yield curve impact of active and passive fiscal policy

	c	ρ	δ	γ_π	γ_y	δ^A	R^2
	Yield maturity: 1 year						
Estimate	-0.0016	0.946	-0.0114	0.1115	0.0784	0.061	0.94
Std.err.	(0.0018)	(0.0318)	(0.0615)	(0.0315)	(0.0400)	(0.0701)	
	Yield maturity: 3 years						
Estimate	-0.002	0.9647	-0.0227	0.0956	0.0546	0.0883	0.95
Std.err.	(0.0018)	(0.0277)	(0.0498)	(0.0247)	(0.0345)	(0.0597)	
	Yield maturity: 5 years						
Estimate	-0.0019	0.9697	-0.0309	0.0873	0.0421	0.096	0.95
Std.err.	(0.0017)	(0.026)	(0.0437)	(0.0216)	(0.0315)	(0.0538)	
	Yield maturity: 10 years						
Estimate	-0.0017	0.9743	-0.0341	0.0774	0.0285	0.095	0.96
Std.err.	(0.0016)	(0.0230)	(0.0359)	(0.0176)	(0.0269)	(0.0453)	